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PATENT APPLICATION

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CASE: 3-84-8-10

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TITLE: CONTROLLED COLLAPSE OF DEPRESSED INDEX OPTICAL FIBER PREFORMS

SERIAL NO: 09/837,983

GROUP ART UNIT: NA

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EXAMINER: NA

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PRELIMINARY AMENDMENT

SIR:

Prior to the examination of this application please enter the following amendments.

In the specification change the paragraph beginning at line 22, page 4, to line 21, page 5 to read:

Brief Description of the Drawing

Figure 1A is a refractive index profile for a W shaped index fiber that can be made using the process of the invention;

Figure 1B is a refractive index profile for a soot body, identical to that used for Figure 1A, but without pre-sintering before fluorine treatment.

Figure 2 is a representation of a porous core rod in a fluorine doping furnace;

Figures 3 and 4 are schematic views of a section through a soot body before (Figure 3) and after (Figure 4) partial consolidation of the soot body according to the invention;

Figure 5 is a plot of doping time vs. refractive index change for equilibrium doping processes;

Figure 6 is a schematic view of a section through a silica particle treated by the incremental doping process of the invention showing the dopant distribution after the deposit step;

Figure 7 is a representative plot of dopant concentration vs. distance for the particle of Figure 6;

Figure 8 is a schematic view of a section the particle of Figure 6 showing the impurity distribution after the drive-in step; and

Figure 9 is a representative plot of dopant concentration vs. distance through the particle of Figure 6.

Change the paragraphs beginning at line 14, page 15, and continuing through line 19 of page 16, to read:

The sintered perform is then used for drawing optical fiber in the conventional way using an optical fiber drawing apparatus with a furnace used to soften the glass preform and initiate fiber draw. The nascent fiber surface is then passed through a coating cup, which has a chamber containing a coating prepolymer. The liquid coated fiber from the coating chamber exits through a die. The combination of the die and the fluid dynamics of the prepolymer, controls the coating thickness. The prepolymer coated fiber is then exposed to UV lamps to cure the prepolymer and complete the coating process. Other curing radiation may be used where appropriate. The fiber, with the coating cured, is then taken up by take-up reel. The take-up reel controls the draw speed of the fiber. Draw speeds in the range typically of 1-20 m/sec. can be used. It is important that the fiber be centered within the coating cup, and particularly within the exit die, to maintain concentricity of the fiber and coating. A commercial apparatus typically has pulleys that control the alignment of the fiber. Hydrodynamic pressure in the die itself aids in centering the fiber. A stepper motor, controlled by a micro-step indexer, controls the take-up reel.

Coating materials for optical fibers are typically urethanes, acrylates, or urethane-acrylates, with a UV photoinitiator added. The apparatus may have a single coating cup, but dual coating apparatus with dual coating cups are commonly used. In dual coated fibers, typical primary or inner coating materials are soft, low modulus materials such as silicone, hot melt wax, or any of a number of polymer materials having a relatively low modulus. The usual materials for the second or outer coating are high modulus polymers, typically

urethanes or acrylics. In commercial practice both materials may be low and high modulus acrylates. The coating thickness typically ranges from 150-300 μm in diameter, with approximately 240 μm standard.

Respectfully submitted,

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MARKED-UP SPECIFICATION

AT PAGES 4, 5, 15, 16

Pages 4, 5.

Brief Description of the Drawing

Figure 1A is a refractive index profile for a W shaped index fiber that can be made using the process of the invention;

Figure 1B is a refractive index profile for a soot body, identical to that used for Figure 1A, but without pre-sintering before fluorine treatment.

Figure 2 is a representation of a porous core rod in a fluorine doping furnace;

Figures 3 and 4 are schematic views of a section through a soot body before (Figure 3) and after (Figure 4) partial consolidation of the soot body according to the invention;

Figure 5 is a plot of doping time vs. refractive index change for equilibrium doping processes;

Figure 6 is a schematic view of a section through a silica particle treated by the incremental doping process of the invention showing the dopant distribution after the deposit step;

Figure 7 is a representative plot of dopant concentration vs. distance for the particle of Figure 6;

Figure 8 is a schematic view of a section the particle of Figure 6 showing the impurity distribution after the drive-in step; and

Figure 9 is a representative plot of dopant concentration vs. distance through the particle of Figure 6. [; and

Figure 10 is a schematic representation of an optical fiber drawing apparatus.]

Pages 15, 16.

The sintered perform is then used for drawing optical fiber in the conventional way [. Figure 10 shows] using an optical fiber drawing apparatus with [preform 31, and susceptor 32 representing the] a furnace [(not shown)] used to soften the glass preform and initiate fiber draw. [The drawn fiber is shown at 33.] The nascent fiber surface is then passed through a coating cup, [indicated generally at 34,] which has a chamber [35] containing a coating prepolymer [36]. The liquid coated fiber from the coating chamber exits through a die [41]. The combination of the die [41] and the fluid dynamics of the prepolymer, controls the coating thickness. The prepolymer coated fiber [44] is then exposed to UV lamps [45] to cure the prepolymer and complete the coating process. Other curing radiation may be used where appropriate. The fiber, with the coating cured, is then taken up by a take-up reel [47]. The take-up reel controls the draw speed of the fiber. Draw speeds in the range typically of 1-20 m/sec. can be used. It is important that the fiber be centered within the coating cup, and particularly within the exit die [41], to maintain concentricity of the fiber and coating. A commercial apparatus typically has pulleys that control the alignment of the fiber. Hydrodynamic pressure in the die itself aids in centering the fiber. A stepper motor, controlled by a micro-step indexer [(not shown)], controls the take-up reel.

Coating materials for optical fibers are typically urethanes, acrylates, or urethane-acrylates, with a UV photoinitiator added. The apparatus [of Figure 10 is shown with] may have a single coating cup, but dual coating apparatus with

dual coating cups are commonly used. In dual coated fibers, typical primary or inner coating materials are soft, low modulus materials such as silicone, hot melt wax, or any of a number of polymer materials having a relatively low modulus. The usual materials for the second or outer coating are high modulus polymers, typically urethanes or acrylics. In commercial practice both materials may be low and high modulus acrylates. The coating thickness typically ranges from 150-300 μm in diameter, with approximately 240 μm standard.